

## Chapter 2. Solving the Problem

Besides California Department of Water Resources Fish Passage Improvement Program there are many public and private efforts to solve the problem of fish passage outlined in Chapter 1. (Some of these are described in Appendix B). A short history of fish passage improvement in California helps put FPIP in context.

### *Historical perspective of fish passage improvement*

There are many public and private efforts to solve the problem of fish passage. Fish passage improvement has included removal of dams and other obstructions, building fish ladders over and around dams or other man-made or natural obstructions, replacing or retrofitting culverts where roads cross streams, screening diversions, and reclaiming gravel-mining pits.

The California Department of Fish and Game has broad jurisdiction over man-made or natural fish barriers, fishways, dam modifications and other barriers. Since the early 1900s, DFG's regional offices and fish-screen shops, have installed hundreds of fish screens at water diversions and has built many fish ladders at dams or other man-made or natural obstructions to fulfill its mandate to ensure fish passage in streams. Since 1992, DFG's Statewide Fish Screen and Fish Passage Program, part of the Inland Fisheries Division's Salmon, Steelhead Trout and Anadromous Fisheries Restoration and Enhancement Program, has been performing the following activities: 1) inventory of water diversion and fish passage problems; 2) evaluation and prioritization of fish screening and fish passage problems; 3) implementation or coordination of fish protection activities; 4) evaluation of existing and proposed fish protective installations; and 5) review of fish screening and fish passage literature.

To date, 469 dams have been removed nationwide for reasons including fish passage, safety, erosion control, and habitat restoration (American Rivers 2000). In California, at least 77 dams have been removed since 1922. (Since there are no centralized records, that number may be low.) From 1990 to 1999, 10 dams were removed, and in 2000 at least 18 dams were removed, including Saultzer Dam and several small check and diversion dams. Table 2-1 lists dams that have been removed in California for which documentation could be obtained.

Appendix B describes other federal and state programs addressing fish passage. Examples of recent or current fish passage improvement projects – some already completed, some in progress – are summarized in Appendix C. Dams that have been removed or are in progress include Saultzer Dam on Clear Creek; Point Four, Western Canal, McGowan, and McPherrin Dams on Butte Creek; and Matilija Dam on Matilija Creek. Woodbridge Dam on the Mokelumne River is an example of a modified dam and the Ratzlaff gravel pit on the Merced River is an example of gravel-pit pond isolation. As a result of removing dams on Butte Creek, the number of adult spring-run Chinook salmon spawners went from 14 in 1987 to 20,000 in 1998. Since the removal of Saultzer Dam from Clear Creek in 2000, state biologists have documented spring-run and fall-run Chinook salmon and steelhead spawning in the 12 miles of creek previously inaccessible above the old dam site. Also, spawning riffles have formed in the creek where the dam and reservoir were located.

Finally, state and federal agencies have funded studies detailing anadromous fish population recovery and stream restoration. Restorations include screening diversions, augmenting spawning gravel, installing fish ladders, increasing flows, controlling water temperatures, restoring riparian vegetation, rehabilitating stream channels, and eliminating instream gravel pits and gravel mining (DFG 1990, 1993, 1996; United States Fish and Wildlife Service (USFWS) 1995, 1998). In addition, many municipal and agricultural water agencies are trying to improve the way they use streams. They know that further declines in biodiversity and fish populations, and delays in recovery of threatened or endangered species, will further hamper their ability to deliver or use water. For example, the Santa Clara Valley Water District, serving urbanized Santa Clara County, has constructed several fish ladders and fish screens at dams and a drop structure, and removed two barriers on streams in its watershed,

Table 2-1. Dams  
Removed in California

opening miles of river for migrating Chinook salmon and steelhead for the first time in perhaps six decades. The district has incorporated stream stewardship practices to help protect and restore fish habitat, introducing new approaches in the District's flood control and water delivery operations. The Stockton East Water District, in largely agricultural San Joaquin County, is cooperating in several first-ever studies on the Calaveras River, from which it draws water, to evaluate fish passage and salmon and steelhead life history. The district hopes the studies will help it better manage, protect and enhance the river's steelhead fishery and continue to serve its customers.

## **Fish Passage Improvement Program**

The Department of Water Resources Fish Passage Improvement Program was started in 1999 as part of an integrated suite of CALFED water supply investigations: Integrated Storage Investigations. Water supply development and its associated infrastructure impact fish, particularly anadromous fisheries in the Central Valley and Bay-Delta watersheds. FPIP's primary objective is to identify and support projects that resolve fish migration problems at man-made structures. These structures can include dams, road crossings, bridges, culverts, flood control channels, erosion control structures, canal and pipeline crossings, and gravel mining pits.

FPIP identifies structures that may impede anadromous and other fish during emigration or immigration to native watersheds, and supports projects that modify or remove those barriers. This is a critical step toward improving riverine habitat and ultimately increasing native fish populations. The program will help implement projects that alter or remove structures that impede migration by developing partnerships with local individuals and agencies. Priority watershed basins will include those where stream restoration projects are already funded and coordinated. The program will focus on identifying passage improvements that have mutual benefits for fish and people who depend on the stream.

FPIP will help DWR and CALFED meet their ecosystem restoration and water management goals by identifying barriers that might be modified or removed. DWR's mission includes protecting, restoring and enhancing the natural environment. Inclusion of the Fish Passage Improvement Program within DWR helps DWR implement its mission and meet its local assistance goals. Working with local water agencies to improve fish passage may result in increased flexibility in managing state water supplies.

CALFED, a program of 23 state and federal agencies, was established to solve the problems in ecosystem, water quality, water supply reliability, and levee and channel integrity. CALFED's plan for restoring the health of the Delta will be done in stages over the next 30 years.

Restoring access to critical spawning habitat for anadromous fish is an integral part of the Ecosystem Restoration Program, a component of CALFED. The ERP is designed to maintain, improve, and increase aquatic and terrestrial habitats and improve ecological functions in the San Francisco Bay and Sacramento-San Joaquin Delta (CALFED 2001). The ERP has several goals. Goal No. 4 includes identifying fish passage needs and opportunities. Dams and other structures are identified as stressors in several of CALFED's regions, including the Sacramento Valley and San Joaquin Valley Regions, and the eastside tributary streams of the Delta Region.

The ERP is also designed to recover at-risk species dependent on the Delta and Suisun Bay, as identified in the CALFED's Multispecies Conservation Strategy. It also supports the recovery of at-risk species in San Francisco Bay and in the watershed above the estuary (CALFED 2001). The MSCS helps ensure that CALFED conforms to provisions of the Federal Endangered Species Act of 1973, California Endangered Species Act, and California Natural Community Conservation Planning Act of 1991. Anadromous fish species included in the MSCS are Central California Coast steelhead evolutionarily significant unit, Central Valley steelhead ESU, Central Valley spring-run Chinook salmon ESU and Central Valley winter-run Chinook salmon ESU, and associated critical habitat for each.

The geographic scope of FPIP is primarily the Sacramento and San Joaquin Valleys and Bay Area below major flood control and water supply reservoirs -- so-called rim reservoirs. FPIP has divided its efforts into four areas: the Sacramento River and tributaries, the lower Sacramento River and eastern Delta tributaries, the Bay Area and western Delta, and the San Joaquin River and tributaries (Figure 1).

This scope corresponds to geographic areas where CALFED MSCS anadromous fish species are found, as well as with most of the geographic scope of the ERP including several of CALFED's Ecological Management Zones as described in Volume II of the Ecosystem Restoration Program Plan (CALFED 2000). In addition, the FPIP scope incorporates the East Bay and South Bay regions of San Francisco Bay, areas within the ERP but not designated as EMZs, and the San Joaquin Valley from the San Joaquin River south to the Kings River, an area outside of the ERP. These areas represent a historical range of anadromous fish below rim reservoirs and present appropriate opportunities for partnerships with local agencies on anadromous fish passage projects, so were included in the FPIP scope. The FPIP does not currently incorporate the ERP watersheds above Lake Shasta because these are above a rim dam.

In 2002, FPIP agreed to assist both the California Coastal Conservancy and CalTrans with barrier inventory or assessment within and outside the original CALFED geographic scope. FPIP is assisting the California Coastal Conservancy with its coastal barrier inventory through an interagency agreement. The Conservancy, with \$750,000 provided by state legislation, is developing a comprehensive assessment of barriers to fish passage in coastal watersheds. The assessment will compile and standardize existing data into an Internet accessible GIS database. A final report of the program is due in Feb 2003.

FPIP is also assisting CalTrans, through an interagency agreement, with a statewide fish passage assessment of state highway culverts. In 2000, Caltrans began implementing a Statewide Passage Barrier Assessment and Correction Program in each of its districts. The assessment started on the Northern California coast (District 1) and is progressing to the northeast and Central Coast (Districts 2, 4, 5). Humboldt State University is doing the field assessment and analysis of state highways in Northern California. FPIP will assess culverts along the remainder of the state's highways.

### ***Priorities for Fish Passage Projects***

The Environmental Coordination, Assessment, and Review Team aided FPIP in developing criteria -- defined by CALFED Ecosystem Restoration Program goals and objectives (CALFED 1997) -- that could be used by the program to decide the priority of structures or projects it will support. The team recommended the following be considered in setting priorities:

- Geographic scope
- The biological basis for selection
- Endangered Species concerns
- Flood control issues
- Water supply issues
- Habitat conditions
- Natural versus man-made barriers
- Definition of barriers to migration (upstream and downstream)
- Implemented or ongoing restoration activities
- Any existing fish passage facilities

**Figure 1. Fish Passage Improvement Program Geographic Scope**

- Public safety issues related to structural barriers to fish migration

Following discussions and feedback on program goals, the criteria for project prioritization were further refined. Criteria for prioritizing projects were divided into two levels identified as Level I and Level II (See sidebar, on Page 2-6).

Level I criteria considers FPIP objectives and scope. These are the primary program criteria used to set project priorities. Projects must meet Level I criteria to be included in the Fish Passage Improvement Program. Level I also includes identifying benefits to ESA-listed salmonids and actions within designated Critical Habitat as set forth by the regulatory agencies of the state and federal governments. There must also be no significant impacts to flood control and it must be possible to mitigate water supply issues.

Level II criteria provide additional prioritization standards for a project based on supporting objectives and goals of the program. Level II criteria, like Level I, also take into account habitat conditions, structural or physical features, as well as program support and coordination activities that assist in achieving program objectives. These criteria consider in more detail project benefits to be gained by implementing an action to improve fish passage. Any one or all of the criteria may be met by any specific project; however, the more criteria that are met, the higher priority that is assigned.

### ***Coordination with other agencies and the public***

FPIP mirrors the CALFED principles. For example, FPIP relies on local leadership and community participation in selecting and implementing fish passage projects or studies; participates in opportunities to increase public knowledge of fish passage problems and proposed projects by holding general workshops and project specific public meetings; and encourages diverse stakeholder involvement in project decision making. FPIP coordinates closely with CALFED agencies such as the USFWS, DFG, U.S. Bureau of Reclamation, and U.S. Army Corps of Engineers.

An Environmental Coordination, Assessment, and Review Team provides guidance to FPIP. Members of the team come from the Department of Fish and Game, DWR, U.S. Fish and Wildlife Service, National Marine Fisheries Service, CALFED, USBR, South Yuba River Citizens League, and Friends of the River, Northern California Water Association and the Yuba County Water Agency. The team assisted in refining FPIP goals and approach; identifying overlaps with other government programs; providing coordination of efforts; and developing criteria for determining which structures in streams should be modified or removed. The interagency coordination team will continue to provide guidance to the program, including prioritizing streams, structures and projects.

FPIP involves the public through forums such as the Coordinated Resource Management Planning programs, public workshops, and cooperative meetings with water users and agency representatives. In addition, the program will participate in or help identify basin workgroups of landowners and water users to coordinate with DFG and other aquatic resources groups such as the Fish Passage Forum to define and develop projects. In cooperation and conjunction with DFG's statewide Fish Passage Coordinator, it will also help on fish passage restoration projects in the form of coordination or project oversight. The program can do project planning, environmental documentation, engineering design, feasibility studies, surveys, and barrier evaluations.

### ***Stream Structures Inventory***

FPIP will inventory potential fish migration barriers in all historical anadromous fish drainages of the Central Valley and the Bay Area and Delta. The program's first phase of the inventory began in early 2000. The inventory database, see Appendix A, will provide a tool that public agencies, watershed groups, and others can use to guide resources to where they will do the most good. Data for the inventory were collected using mostly existing state and federal agency or private data files and published reports. Pertinent documents generated by CVPIA, CALFED, and state resources agencies were reviewed. Additionally, DFG files were reviewed for unpublished data, and program staff conducted interviews with regional

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biologists from state, federal and local water agencies, established watershed Coordinated Resource Management Planning groups, local environmental or stream advocacy groups, and consultants.

Inventory data consist of the structure's name or identifying descriptor; river mile; latitude and longitude; physical description and present use; stream name; and condition of fish passage facilities. Appendix A describes more than 500 structures in streams in the Central Valley and Bay Area. Other reports have already identified some of these structures as partial or complete barriers to migrating anadromous fish, and some structures remain to be evaluated. The inventory provides information that public agencies, watershed groups, and others can use in watershed management strategies to recover declining salmonid populations.

The inventory can be used to:

1. Identify potential barriers to fish migration.
2. Consider watershed basins for assessment of barrier remediation or removal and prioritization based on restoration programs and potential benefits to migratory salmonid populations.
3. Prioritize barriers in each watershed for future modification or removal based on criteria developed by stakeholders, watershed groups and others.

Barriers to fish migration occur in many ways. Fish migration and instream movement can be impeded by lack of water, poor water quality, poor habitat, natural occurrences such as landslides, waterfalls, boulder cascades, and man-made structures. Identifying natural and man-made conditions that create potential and obvious fish migration barriers was key in developing program objectives.

FPIP's primary objective is to identify and support projects that resolve fish migration problems at man-made structures, which can include dams, road crossings, bridges, culverts, flood control channels, erosion control structures, canal and pipeline crossings, and gravel mining pits.

The program does not have the authority to initiate water acquisitions as a primary objective. Therefore, directly acquiring water for streams and rivers where there is little or no water over most water years due to over-allocation is outside the purview of FPIP. However, the program supports finding solutions to limited surface water supplies and will participate in forums to discuss and implement workable water supply alternatives. The program will treat water quality issues the same way. Other state and federal agency programs exist that address surface water quality issues.

### **Local Assistance**

FPIP is already supporting several priority fish passage improvement projects with identified benefits to listed anadromous species. These priority projects are detailed in Chapter 4. Chapter 3 presents descriptions of riverine habitat conditions, the status of Chinook salmon and steelhead populations, and current restoration projects on streams and rivers in the program area.

Fish passage improvement options at a structure can include removal, partial removal, new or improved fish ladders, or major structural redesign. Examples of some of these include removing Saeltzer Dam on Clear Creek, or eliminating gravel pits on the Merced River (see Chapter 3). Decisions to remove barriers or modify structures, such as improving fish ladders, will be made using the best available data and science. While ultimately, the decision regarding remediation will be addressed during environmental reviews of each project, the Fish Passage Improvement Program will base its support on:

- Quantified estimates and comparisons of fish numbers and habitat utilization between removal alternatives and structural improvement alternatives.

- Identification of environmental impacts and mitigation measures between removal and structural improvement alternatives.
- Impacts to flood control, water use, or power under removal or structural improvement alternatives.
- Long-term maintenance and repair costs associated with structural improvement alternatives, and identification of who will be responsible for long-term maintenance.
- Comparison of costs between removal and structural improvement alternatives.
- Monitoring to determine if structural improvements have been effective and to provide subsequent remediation through removal if they prove to be ineffective.

#### FISH PASSAGE IMPROVEMENT PROGRAM CRITERIA

##### Level I (First Priority)

1. Central Valley/Bay Area within CALFED solution area.
2. Below “rim” dams (major flood control, water, power supply facilities)
3. Benefits native salmonids
4. Located within Critical Habitat
5. First downstream impediment
6. Established program or stakeholder supported

##### Level II (Supporting Considerations)

1. Barrier has existing non-functional passage facility
2. Will not impact flood protection
3. Water supply impacts can be mitigated
4. Benefits ESA listed salmonids
5. Historical habitat for listed species
6. Identified interagency priority action
7. Existing good quality habitat above barrier
8. Significant habitat gain within historical/Critical Habitat

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**Table 2-1. Dams Removed in California**

<b>Year Removed</b>	<b>Dam</b>	<b>River</b>	<b>Reason</b>	<b>Owner</b>
1922	Russell (Hinkley) Dam	Hayfork Creek		
1925	Hessellwood Dam	Hayfork Creek		
1927	Henry Danninbrink Dam	Canyon Creek		
1936	Anderline Dam	Rush Creek		
1946	D.B. Fields / Johnson Dam	Indian Creek		
1946	Bonally Mining Co. Dam	Salmon River		
1946	Dam	Trinity River		Trinity City Water and Power Co.
1947	D.B. Fields Dam	Indian Creek		
1947	Altoona Dam	Kidder Creek		
1949	Three C. Picket Dam	Beaver Creek		
1949	Big Nugget Mine Dam	Horse Creek		
1949	Moser Dam	Swillup Creek		
1949	Todd Dam	Trinity River		
1949	Smith Dam	Whites Gulch		
1950	Clarissa V. Mining Dam	Redding Creek		
1950	Bennet-Smith Dam	Salmon River		
1950	Barton Dam	Scoitt River		
1950	North Fork Placers Dam	Trinity River		
1951	Red Hill Mining Co. Dam	Canyon Creek		
1951	Quinn Dam	Trinity River		
1970	Sweasey Dam	Mad River		City of Eureka
1985	Diversion dam	Oristimba Creek drainage (Henry Coe State Park)	Erosion/failure	California State Parks
1985	Rock Creek dam	Rock Creek		Pacific Gas and Electric Co.
1986	Diversion dam (3 total)	Coyote Creek drainage (Henry Coe State Park)	Erosion/failure	California State Parks
1987	Happy Isles Dam	Merced River (Yosemite National Park)		National Parks Service
1987	Diversion dam (2)	Pacheco Creek drainage (Henry Coe State Park)	Erosion/failure	California State Parks
1989	Lake Christopher Dam (breached)	Cold Creek	Safety hazard	City of South Lake Tahoe
1989	Upper Dam	Lost Man Creek		
1992	Unnamed dam #1	Wildcat Creek		
1992	Unnamed dam #2	Wildcat Creek		
1993	C-Line Dam #1	Tributary to MacDonald Creek	Habitat improvement	National Parks Service Redwood National Park
1993	Point Four Dam	Butte Creek	Fish passage	Western Canal Water District
1993	Diversion dam	Ritchie Creek (Bothe-Napa Valley State Park)	Fish passage	California State Parks



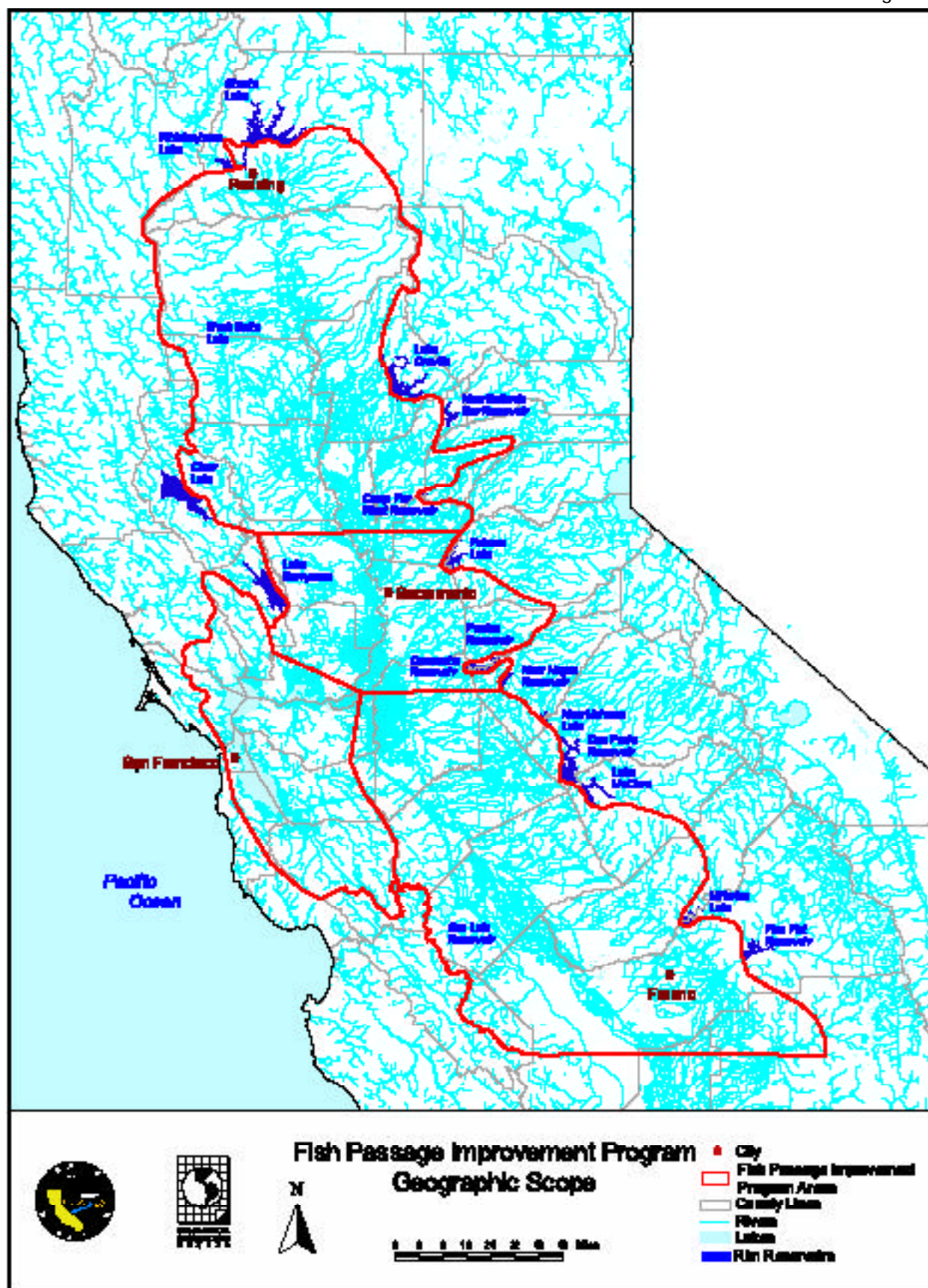
**Table 2-1 (continued). Dams Removed in California**

<b>Year Removed</b>	<b>Dam</b>	<b>River</b>	<b>Reason</b>	<b>Owner</b>
1998	McGowan Dam	Butte Creek	Fish passage	
1998	McPherrin Dam	Butte Creek	Fish passage	McPherrin Family
1998	Western Canal East Channel Dam	Butte Creek	Fish passage	Western Canal Water District
1998	Western Canal Main Dam	Butte Creek	Fish passage	Western Canal Water District
1998	Unnamed small dam #1 (weir)	Guadalupe River		
1998	Unnamed small dam #2 (weir)	Guadalupe River		
2000	Diversion dam	(Bothe-Napa Valley State Park)	Habitat improvement	California State Parks
2000	McCormick – Saeltzer Dam	Clear Creek	Fish passage	Townsend Flat Water - Ditch Company
2000	Concrete check dams (13 total)	Fife Creek (Armstrong Redwoods State Reserve)	Sedimentation, erosion	California State Parks
2000	Diversion dam	Mill Creek (San Mateo County)	Erosion, habitat improvement	California State Parks
2000	Concrete check dam	Sausal Creek (Alameda County)	Habitat improvement	City of Oakland
2000	Wilder Creek Dam	Wilder Creek (Wilder Ranch State Park)	Erosion, habitat improvement	California State Parks
2002	Crocker Creek Dam	Crocker Creek (Sonoma County)	Erosion/failure, fish passage	Sonoma Co. Water Agency
2002	Haypress Pond Dam	Unnamed tributary (Golden Gate National Recreation Area)	Safety, habitat improvement	National Park Service
2002	Horseshoe Pond Dam	Unnamed tributary (Point Reyes National Seashore)	Safety, habitat improvement	National Park Service
2002	Unnamed road crossing	Solstice Creek	Fish passage	National Park Service
2002	Unnamed dam	Ferrari Creek (Santa Cruz County)	Habitat improvement, fish passage	Trust for Public Land
2002 (scheduled)	St. Helena diversion	York Creek (Napa County)	Fish passage	City of St. Helena
Unknown	Big Creek Mfg. Dam	Big Creek		
Unknown	Trout Haven Dam	Monkey Creek		
Unknown	Merry Mountain Guzzler Dam	Unnamed	Safety	Whiskeytown-Shasta-Trinity National Recreational Area
Unkown	Arco Pond Dam	Lost Man Creek	Fish passage	National Parks Service Redwood National Park
Unkown	John Muir #1 Dam	Alhambra Creek Tributary	Safety	

**Table 2-1 (continued). Dams Removed in California**

<b>Year Removed</b>	<b>Dam</b>	<b>River</b>	<b>Reason</b>	<b>Owner</b>
Unknown	Small diversion dam	Green Valley Creek (Sonoma County)		
Unknown	Minnie Reeves Dam	Indian Creek		
Unknown	Salt Creek Dam	Salt Creek		
Unknown	Dam	San Luis Obispo Creek		
Unknown	Lone Jack Dam	Trinity River		

Figure 1



## Other Chapters

Chapter 1. The Problem: Fewer Salmon and Steelhead in the Central Valley and San Francisco Bay Area

Chapter 2. Solving the Problem

Chapter 3. Existing Habitat Conditions and Status of Fish Populations

Chapter 4. Current Program Activities

Appendix A Known Structures Within CALFED ERP Geographic Scope

Appendix B: Applicable Laws and Examples of Fish Passage Programs at Other Agencies

Appendix C: Structure Removal Examples and Challenges

Appendix D: Evolutionarily Significant Units, Critical Habitat, and Essential Fish Habitat

Appendix E: Literature Cited